NON-PUBLIC?: N
ACCESSION #: 8905050348
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Dresden Nuclear Power Station, Unit 3 PAGE: 1 of 10

DOCKET NUMBER: 05000249

TITLE: Reactor Scram Due to the Failure of an Electrical Protection Assembly Breaker
EVENT DATE: 03/30/89 LER #: 89-002-00 REPORT DATE: 05/01/89

OPERATING MODE: N POWER LEVEL: 070

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Ronald Jackson, Technical Staff Engineer TELEPHONE: (815) 942-2920 ext. 2483

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: JC COMPONENT: BKR MANUFACTURER: G080
X IL MON G080
REPORTABLE TO NPRDS:

SUPPLEMENTAL REPORT EXPECTED: YES EXPECTED SUBMISSION DATE: 11/01/89

ABSTRACT:

On March 30, 1989 at 1253 hours with Unit 3 operating at 70% rated core thermal power, a reactor scram occurred while the Technical Staff was performing Dresden Technical Surveillance (DTS) 500-2, Functional Testing of RPS MG Set and RPS Reserve Power Supply. The cause of the scram was due to a spurious trip of Electrical Protection Assembly (EPA) breaker 3A-1 on Reactor Protection System (RPS) Bus B with a concurrent lock-up condition of the 3A Main Steam Line (MSL) radiation monitor. The RPS Bus B trip occurred at the same time attempts to reset the half scram on RPS Channel A were taking place. The Nuclear Station Operator (NSO) was unable to reset the RPS Channel A half scram due to the lock-up condition on the 3A MSL radiation monitor. The lock-up condition has the potential of occurring upon re-energizing the monitor following a momentary (less than approximately one second) power interuption. During the lock-up condition the radiation monitor remains in a tripped condition. The condition is corrected by de-energizing the monitor for approximately ten

seconds after which time the monitor is re-energized. A second and third reactor scram occurred at 1338 hours and 1742 hours respectively. The second scram was caused by Operations Department personnel transferring over power supplies to RPS Bus A in an attempt to clear the radiation monitor lock-up condition. The third scram was caused by another spurious trip of EPA breaker 3A-1. Corrective actions for this event included shipping the 3A-1 EPA breaker to the manufacturer for determination of the failure mode, evaluation of a potential modification to the logic card for the MSL radiation monitors and revisions to the RPS testing procedures regarding this potential radiation monitor lock-up condition. The safety significance was minimal since the RPS System operated as designed. This was the first occurrence of its type at Dresden.

END OF ABSTRACT

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2527 MWt rated core thermal power.

Nuclear Tracking System (NTS) tracking code numbers are identified in the text as (XXX-XXX-XX-XXXXX).

EVENT IDENTIFICATION:

Reactor Scram during testing of Reactor Protection System (RPS) Electrical Protection Assemblies (EPAs) due to the failure of an EPA breaker.

A. CONDITIONS PRIOR TO EVENT:

Unit: 3 Event Date: March 30, 1989 Event Time: 1253 hours

Reactor Mode: N Mode Name: Run Power Level: 70%

Reactor Coolant System (RCS) Pressure: 970 psig

B. DESCRIPTION OF EVENT:

On March 30, 1989 at 1253 hours with Unit 3 operating at 70% rated core thermal power, a reactor scram occurred while the Technical Staff was performing Dresden Technical Surveillance (DTS) 500-2, Functional Testing of RPS MG Set and RPS Reserve Power Supply. At the time of the reactor scram RPS Bus A JC! was being transferred to the normal power supply (RPS MG B) following successful testing of the Electrical Protection Assembly (EPA) breakers for RPS Bus A. Following the power transfer, the half scram on RPS Channel A would not reset as indicated by Control Room annunciators due to a trip of a Main Steam Line (MSL) radiation monitor IL!. The Center Desk Nuclear Station Operator (NSO) inspected the radiation monitors on Control Room Panel 903-18 and found the 3A MSL radiation monitor reading "mode unknown". In an attempt to clear the problem with the 3A MSL radiation monitor in order to reset RPS Channel A, the NSO directed the High Voltage Operator (HVO) to transfer RPS Bus A back to the reserve power supply. However, before the HVO could complete the power transfer, a spurious trip of EPA breaker 3A-1 occurred on RPS Bus B. See Figure 1. This caused the de-energization of RPS Bus B, which resulted in a reactor scram.

The reactor scram caused a drop in water level to -3.1 inches which caused the initiation of Primary Containment Group II and Group III Isolations JM!. Upon recovery of the water level, both Primary Containment Isolations were reset and the Reactor Water Cleanup (RWCU) System CE! was realigned to establish a stable cooldown rate. Approximately 90 seconds after the reactor scram, the Center Desk NSO observed that the main generator TB! did not trip on reverse power with approximately -20 MWe indicated on the Center Desk display. The NSO immediately tripped the main generator output breakers to prevent motoring of the generator. Other equipment related occurrences following the reactor scram included closure of the Recirculation System AD! sample valves 3-220-44 and 45, closure of Isolation Condenser BL! valves 3-1301-17 and 20 and de-energization of the Main Steam Isolation Valve (MSIV) SB! AC pilot solenoid light indication.

At 1338 hours, a second reactor scram occurred when the HVO transferred RPS Bus A to reserve power in an attempt to clear the 3A MSL radiation monitor alarm. The HVO did not rea
ize that the RPS Bus 8 was de-energized due to failure of EPA breaker 3A-1. Additionally, the de-energization of both RPS Busses caused both recirculation pumps to trip and a second Primary Containment Group II and III Isolation occurred. At 1342 hours, the HVO reset EPA breakers 3A-1 and 3A-2 and restored normal power to the RPS Busses A and B. This enabled the NSO to reset both RPS Channel A and B and the Primary Containment Group II and III Isolations. The NSO then realigned the RWCU System to re-establish a stable cooldown rate to bring the reactor to a cold shutdown condition. The recirculation pumps were subsequently restarted by 1735 hours.

While conducting the shutdown in accordance with Dresden General Procedure (DGP) 2-1, Unit 2(3) Normal Unit Shutdown, a third reactor scram occurred at 1742 hours. Subsequently, it was determined that EPA breaker 3A-1 had spuriously tripped again thus causing a trip of the RPS Bus B. Since reactor pressure was less than 600 psig and the main condenser vacuum was lower than the scram setpoint at the time of the EPA breaker trip, a reactor scram occurred when

RPS Bus B de-energized due to the de-energization of the low condenser vacuum bypass relays. These relays bypass the low condenser vacuum and MSIV closure scrams when reactor pressure is less than 600 psig. Immediately following the reactor scram, RPS Bus B was realigned to the reserve power supply and jumpers were installed across the low condenser vacuum and Main Steam Line closure bypass relays. This action was taken to prevent additional unexpected scrams due to any further spurious trips or transfers of the RPS Busses.

C. APPARENT CAUSE OF EVENT:

This report is being submitted in accordance with Title 10 of the Code of Federal Regulations Part 50 Section 73(a)(2)(iv), which requires the reporting of any event that results in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System.

The cause of the initial reactor scram was due to a spurious trip of the EPA breaker 3A-1 (RPS Bus B) and the concurrent lock-up of the 3A MSL radiation monitor (RPS Bus A). Tripping of EPA breaker 3A-1 was also the root cause for the third reactor scram. To determine if any abnormalities existed with the EPA breaker, a calibration check was performed in accordance with DTS 500-3, Calibration of RPS MG Set and RPS Reserve Power Supply EPAs. However, no problems found during the calibration. Consequently, the cause of the breaker failure is currently unknown but it is expected to be determined following inspection of the EPA breaker by the General Electric Company.

The lock-up of the 3A MSL radiation monitor is a characteristic of the monitor which has the potential of occurring when the monitor is powered up after de-energization. In discussing this problem with the manufacturer (General Electric), it was recognized that this condition only occurs during short momentary power interruptions (less than one second).

The second reactor scram that occurred during this event was caused by a lack of awareness of system configuration on the part of the HVO.

Following the initial reactor scram a manual trip of the main generator output breakers was required. It was initially believed that the secondary reverse power relay failed to operate since the output breakers remain closed. However, it was later suspected that the NSO did not allow the secondary reverse power relay sufficient time to react. This conclusion proved to be incorrect, however, when manual action was again required to trip the main generator following a subsequent Unit 3 scram on April 15, 1989 (LER 88-006-0, Docket 050249). After the April 15, 1989 scram occurred, the NSO waited approximately three minutes for the main generator output breakers to open on reverse power. At this time, a main turbine trip was manually initiated and the main generator was isolated from the grid by the primary reverse power relay. Since the secondary reverse power relay failed during the April 15, 1989 event, it is believed the relay also failed during the scram caused by the spurious trip of EPA breaker 3A-1. The Operation Analysis Department (OAD) inspected the relay per Work Request 84140 and found dirt between the bearing and contact pivot arm on the directional unit of the relay. See Figure 2. The dirt caused mechanical binding of the contact pivot arm which prevented the contact from closing thereby causing the failure of the relay to operate.

During this event, both recirculation pumps tripped following the de-energization RPS Busses A and B. As indicated in Figure 3, de-energizing RPS Busses A and B caused relays 595-107A and 595-107B in the Primary Containment Isolation logic to dropout thereby causing the closure of the appropriate relay contacts. Consequently, the trip coil of both recirculation pump MG sets energized which resulted in tripping of the recirculation pumps. The power loss to both RPS Busses also caused the Primary Containment Group II and III Isolations due to de-energization of the Primary Containment Isolation relays.

Following the first reactor scram, it was discovered that Recirculation System sample valves 3-220-4-1 and 45 and Isolation Condenser valves 3-1301-17 and 20 had closed. In addition, the HVO noted that the MSIV AC pilot solenoid lights were no longer illuminated. These abnormalities are believed to be caused by a momentary loss of power to the auxiliary relays associated with the above equipment. The relays are supplied by the Instrument Bus EC! which is powered by the Unit Auxiliary Transformer 31 through 4 KV Bus 33, 480 Volt Bus 38 and Motor Control Center (MCC) 38-2 as shown in Figure 4. After a scram, an automatic transfer of power occurs between the Unit Auxiliary Transformer 31 and the Reserve Auxiliary Transformer 32 which results in a momentary loss of power to the Instrument Bus. The momentary loss of power to the Instrument Bus occurs because Air Circuit Breaker (ACB) 3312 must open prior to ACB 3303 automatically closing. This is accomplished by means of an ACB 3312 "b" auxiliary contact ("b" contact is closed when the ACB is open) installed in the auto close circuit of ACB 3303. The automatic transfer occurs in cycles, however lasts long enough for the relays to dropout causing the above equipment to de-energize. The relay dropout does not always occur under this condition and is dependent upon the speed of the auto transfer. Since seal-in logic circuits are used, the de-energized equipment remains de-energized until the circuitry is reset by the NSO.

D. SAFETY ANALYSIS OF EVENT:

The Reactor Protection System is designed to initiate a reactor scram upon loss of power to both RPS Busses. During all three instances in which the loss of power to both RPS Busses occurred, the Reactor Protection System fully met this design function. During the initial scram, the reactor water level dropped to -3.1 inches which resulted in the Primary Containment Group II and III Isolations, also as designed. The safety of the reactor and fuel was maintained at all times since the water level was always maintained above the low low water level setpoint of -59 inches at which point initiation of the Emergency Core Cooling Systems (ECCS) occurs. In addition, if an alternate means for reactor water make-up and reactor cooling was needed during this event, all the ECCS Systems, such as Low Pressure Coolant Injection (BO), Core Spray BM!, High Pressure Coolant Injection BJ! and Automatic Depressurization System BS!, were operable and available for use.

The main generator protective relaying is designed whereby two circuits will independently trip the generator on reverse power. The first circuit, associated with a primary reverse power relay, is initiated subsequent to a turbine trip signal and is designed to trip the generator at -1.3 MWe after a five second time delay. The second trip circuit is a secondary reverse power relay which is designed to trip the main generator at -1.3 MWe with a 15 second time delay in the absence of a turbine trip signal. Thus, the secondary reverse power relay should have initiated the generator trip since there were no turbine trip signals present. Although the secondary reverse power relay failed during this event, the primary reverse power relay was operable and available in the event of a turbine trip. Also, the manual capability of tripping the turbine operated successfully thereby preventing damage to the generator.

Based on the reasons mentioned above, the safety significance of this event was considered minimal.

E. CORRECTIVE ACTIONS:

Immediate corrective actions included resetting of the 3A MSL radiation monitor and removing from service the normal power supply to the RPS Bus B to prevent additional spurious trips of EPA breaker 3A-1. A calibration check was performed on the EPA breaker 3A-1, however, no abnormalities were found. In order to prevent further spurious trips, EPA breaker 3A-1 was replaced with the existing EPA breaker 3AB-2 from the reserve RPS Bus power supply since a spare was not readily available. An authorized jumper was temporarily installed in the EPA breaker 3AB-2 cubicle until a new EPA breaker could be obtained and installed. This replacement took place on March 31, 1989.

EPA breaker 3A-1 was shipped to General Electric in order to determine the exact failure mode of the breaker. Upon determination of the failure mode, further corrective actions will be evaluated to prevent a recurrence of this event

(249-200-89-02001). A supplement to this report will be issued to document the failure mode and list any further corrective actions taken (249-200-89-02002).

Also, the RPS MG Set calibration and functional test procedures, DTS 500-1, 2 and 3 will be revised to include a caution regarding potential lock-up of the MSL radiation monitors and required actions to prevent it from occurring (249-200-89-02003). Also, a potential modification is being evaluated to modify the logic card on the radiation monitors which will eliminate the lock-up condition (249-200-89-02004).

The correction action for the relay problem associated with the Recirculation System sample valves 3-220-44 and 45, the Isolation Condenser valves 3-1301-17 and 20 and the MSIV AC pilot solenoid indicating lights has already been initiated as a result of LER 87-024-0, Docket 050237. This corrective action involves replacing the relays associated with the affected equipment with time delay dropout relays per Modification M12-3-88-60.

In determining the cause of failure with the main generator secondary reverse power relay, OAD inspected the relay and found dirt between the bearing surface and the contact pivot arm surface. After removing the dirt between the surfaces, the relay operated successfully. The reverse power relays are inspected and calibrated on a refueling outage basis in accordance with the OAD Protective Relay Calibration Procedure. There were no problems discovered during the previous inspection. To prevent future failures of this type, the relay calibration procedure will be revised to clarify the physical inspection section such that mechanical binding of the relay pivot arm is specifically addressed (249-200-89-02005).

F. PREVIOUS OCCURRENCES:

This is a first occurrence involving a reactor scram due to a spurious trip of a RPS Bus EPA breaker and concurrent malfunction of the MSL radiation monitor.

G. COMPONENT FAILURE DATA:

Manufacturer Nomenclature Model Number Mfg. Part Number

General Electric Breaker 914E175 N/A

General Electric Radiation Monitor 304A3700 N/A

An NPRDS data search was conducted to determine if other componen
failures have
occurred on similar equipment throughout the nuclear industry. In reviewing the

data, one failure was found with a RPS EPA breaker. The breaker had failed to close during a surveillance test due to friction and poor alignment of the undervoltage release attachment linkage. The breaker was replaced and retested satisfactorily.

In addition, the data revealed that 26 failures have occurred with General Electric Model 304A3700 radiation monitors. The cause of these failures includes defective analog trip module, loose connections, bad connectors, defective femtoammeter, worn key switch, bad amplifier, instrument setpoint drift, faulty high voltage card and a defective input/output module. There were three failures involving instrument setpoint drift of which all occurred at Dresden Station. There were no failures found regarding a monitor lock-up condition.

A review was also conducted of previous Station Deviation Reports. One failure was found regarding RPS EPA breakers which has been documented under Deviation Report 12-2-84-116. This event occurred during a calibration surveillance on RPS EPA breaker 2A-2. The breaker failed to close electrically upon manual closure. The cause was attributed to misadjustment of the breaker contact wipe.

FIGURE OMITTED - NOT KEYABLE (DRAWING)

REACTOR PROTECTION SYSTEM POWER SUPPLY
Figure 1

FIGURE OMITTED - NOT KEYABLE (DRAWING)

SIMPLIFIED VIEW OF REVERSE POWER PLAY
Figure 2

FIGURE OMITTED - NOT KEYABLE (DRAWING)

RECIRCULATION PUMP TRIP LOGIC
Figure 3

FIGURE OMITTED - NOT KEYABLE (DRAWING)

INSTRUMENT BUS POWER SUPPLY
Figure 4

ATTACHMENT 1 TO 8905050348 PAGE 1 OF 1

Commonwealth Edison
Dresden Nuclear Power Station
R.R. #1
Morris, Illinois 60450
Telephone 815/942-2920

May 1, 1989

EDE LTR #89-346

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Licensee Event Report #89-002-0, Docket #050249 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR50.73(a)(2)(iv).

E.D. Eenigenburg
Station Manager
Dresden Nuclear Power Station

EDE/jmt

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
File/NRC
File/Numerical

0565k

*** END OF DOCUMENT ***